

CHAPTER 8

ADVANCED OPTICS, LASERS, AND IRON SIGHTS (Phase V of Basic Rifle Marksmanship)

Basic rifle marksmanship taught effective engagement of the enemy with the basic rifle or carbine using iron sights to engage targets primarily during the day. Advanced rifle marksmanship added other marksmanship situations that a combat soldier may encounter. This chapter discusses how to enhance marksmanship skills, with proper training, using the Army's newest optics and lasers to ensure the soldier can fight as well at night as he can during the day.

8-1. TRAINING STRATEGIES AND QUALIFICATION STANDARDS

An established day and night advanced marksmanship program equipped with training strategies and proposed qualification standards has been developed.

a. Before beginning a night marksmanship program, soldiers must qualify on their assigned weapons during daylight conditions as outlined in the previous chapters of this manual. This chapter implements new night qualification standards to compliment current Army training strategies.

b. Commanders should follow these training strategies and abide by the qualification standards set forth to the best of their abilities. Although some courses of fire may seem redundant or inappropriate, numerous tests show that these training strategies work and the qualification standards are achievable if the strategy is followed.

8-2. BORELIGHT

The borelight is an accurate means of zeroing weapons and most aided-vision equipment without the use of ammunition. Time and effort must be applied to ensure a precise boresight, which will in turn save time and ammunition. Table 8-1 outlines weapon and aided-vision device combinations that can be zeroed using the borelight with the M16/M4-series weapons. (Figure 8-1 shows the current borelight training program.)

	M16A2	M4/MWS
BACK-UP IRON SIGHT	M16A2 Iron sight can be boresighted	X
AN/PAQ-4B/C	X	X
AN/PEQ-2A	X	X
AN/PAS-13	X	X
M68 CCO	X	X

Table 8-1. Weapon and aided-vision device combinations.

NOTE: The precise boresighting of a laser will allow direct engagement of targets without a 25-meter zero. If a borelight is not available, a 25-meter zero must be done to zero the device. All optics will be 25-meter zeroed; a borelight only aides in zeroing.

Instructional Intent:

Align the bore of the weapon to the optic, laser or iron sight being fired to reduce or eliminate the time and ammunition it currently requires to live fire zero.

Special Instructions:

Zero the borelight.

Use only approved 10-meter boresight targets from Picatinny Arsenal (noted on offset).

Ensure you use the proper 10-meter boresight target for weapon configuration.

Ensure boresighting is conducted 10 meters from the end of the barrel.

Ensure weapon and target is stabilized or the boresight will not be accurate.

Ensure filters for aiming lasers are installed to reduce blooming.

Observables:

Confirm that the borelight spins on itself when zeroed at 10 meters.

Weapon configuration is boresighted using the official and proper targets only.

Confirm the target and weapon is not moving during the boresighting procedure.

Confirm that the borelight is centered on the circle on the target.

Confirm that the aiming device is aiming at the center of the crosshair on the offset.

Figure 8-1. Borelight training program.

DANGERS

1. DO NOT STARE INTO THE VISIBLE LASER BEAM.
2. DO NOT LOOK INTO THE VISIBLE LASER BEAM THROUGH BINOCULARS OR TELESCOPES.
3. DO NOT POINT THE VISIBLE LASER BEAM AT MIRROR-LIKE SURFACES.
4. DO NOT SHINE THE VISIBLE LASER BEAM INTO OTHER INDIVIDUALS' EYES.

WARNINGS

1. Make sure the weapon is CLEAR and on SAFE before using the borelight.
2. Ensure that the bolt is locked in the forward position.
3. When rotating the borelight to zero it, ensure the mandrel is turning counter clock wise (from the gunners point of view) to avoid loosening the borelight from the mandrel.

a. **Concept.** Boresighting is a simple procedure that can and will save time and ammunition if the procedures outlined here are strictly followed. The visible laser of the borelight is aligned with the barrel of a designated weapon. Then, using a 10-meter

boresight target, the weapon can be boresighted with any optic, laser, or iron sight that the soldier is assigned to fire.

(1) To boresight the weapon using the borelight, ensure that the visible laser is in line with the barrel, zero the borelight to the weapon, and then place the visible laser of the borelight in a designated spot on the 10-meter boresight target. When this is done, move the aiming point of the aiming device to the crosshair on the 10-meter boresight target. The weapon system is now boresighted and ready to engage targets or conduct a 25-meter zero.

(2) With optics, such as the M68, TWS, and AN/PVS-4, the borelight will put the soldier on paper at 25 meters, thus reducing time and ammunition trying to locate rounds during 25-meter zeroing. With lasers, the borelight allows the soldier to boresight and then engage targets, eliminating the 25-meter zeroing procedures altogether.

b. **Zeroing the Borelight.** Before boresighting the weapon system the borelight must first be zeroed to the weapon. To zero the borelight to the weapon, align the visible laser with the barrel of the weapon. Stabilizing the weapon is crucial. The weapon can be stabilized in a rifle box rest or in a field location by laying two rucksacks side by side. Lay the weapon on the rucksacks and then lay another rucksack on top of the weapon to stabilize it.

CAUTION

Do not over adjust the laser or point it at soldiers or reflective material.

NOTE: The weapon does not have to be perfectly level with the ground when boresighting.

(1) Attach the 5.56-mm mandrel to the borelight.

(2) Insert the mandrel into the muzzle of the weapon. The borelight is seated properly when the mandrel cannot be moved any further into the muzzle and the mandrel spins freely. Stabilize the weapon so it will not move.

(3) Measure 10 meters with the 10-meter cord that comes with the borelight or pace off eleven paces.

(4) The zeroing mark is a small dot drawn on a piece of paper, tree bark, or the borelight reference point on the 10-meter boresight target (Figure 8-2, page 8-4).

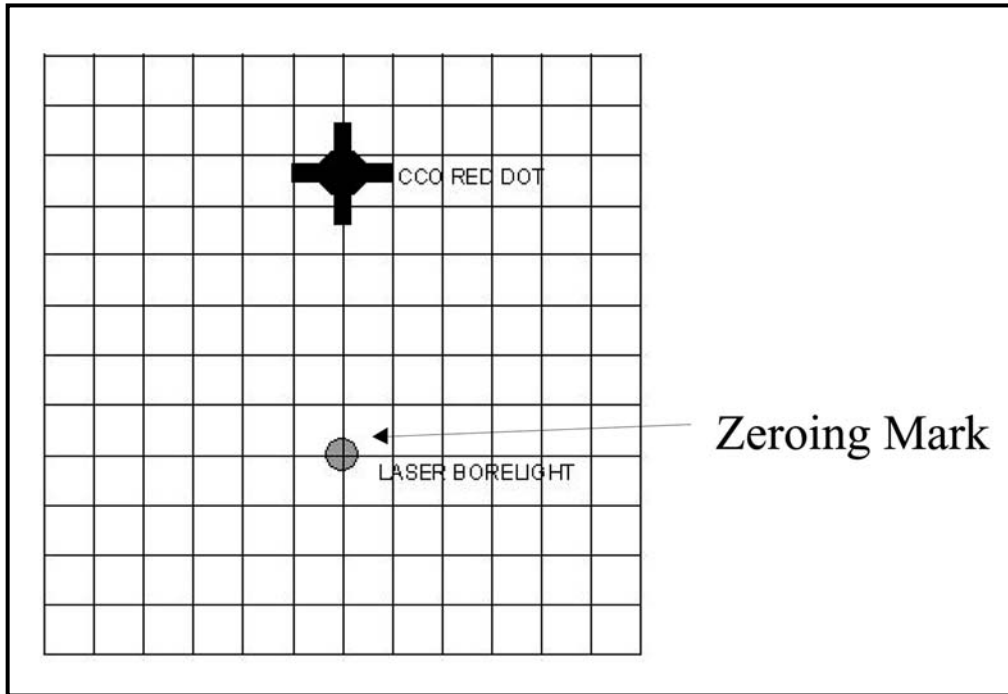


Figure 8-2. Example of a zeroing mark.

(5) Rotate the borelight until the battery compartment is facing upward and the adjusters are on the bottom (Figure 8-3). This position of the borelight, and where the visible laser is pointing, is identified as the start point.

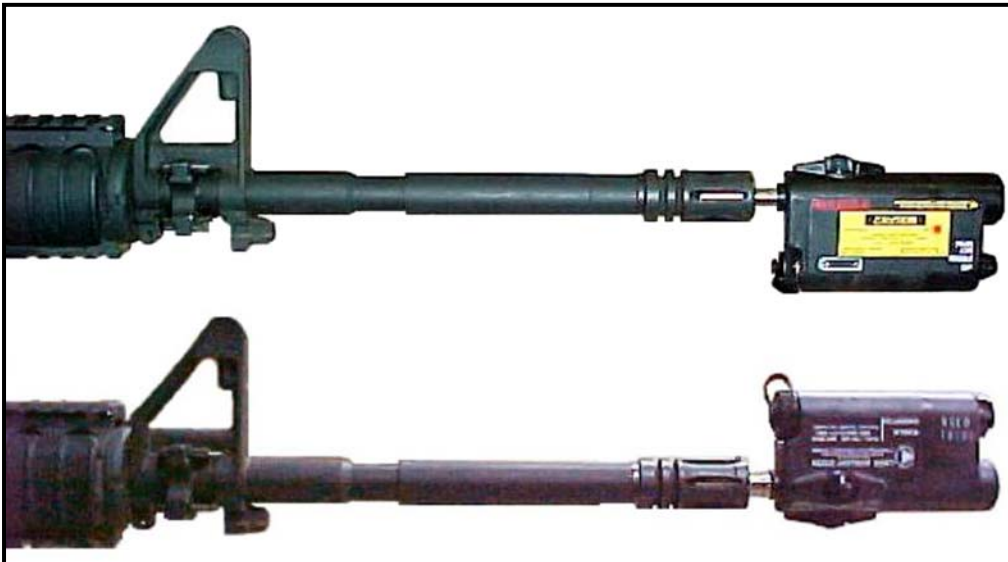


Figure 8-3. Borelight in the START POINT position.

(6) Rotate the borelight until the battery compartment is down and the adjusters are on top to allow for easy access to the adjusters and help with communication and stabilization of the weapon (Figure 8-4). This position of the borelight, and where the visible laser is pointing, is identified as the half turn position.

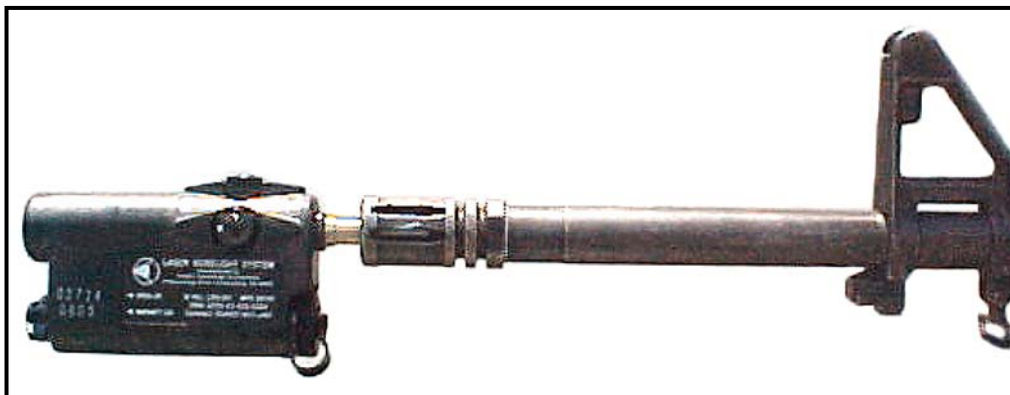


Figure 8-4. Borelight in the HALF TURN position.

NOTE: The commands “START POINT” and “HALF-TURN” are given to ensure clear communication between the soldier at the weapon and the soldier at the boresight target.

(7) The reference point is the point approximately halfway between the start point and the half-turn point (Figure 8-5).

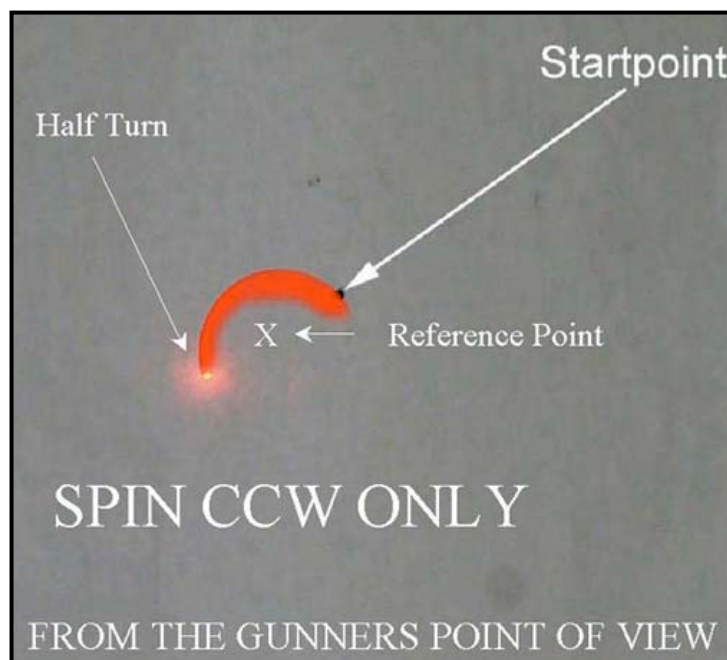


Figure 8-5. Example of a start point, half turn, and reference point.

(8) Turn the borelight on and spin it until it is in the start point position. Place the zeroing mark approximately 10 meters from the end of the barrel so that the visible laser strikes the zeroing mark.

(9) Slowly rotate the borelight 180 degrees while watching the visible laser made by the borelight. If the visible laser stops on the zeroing mark, the borelight is zeroed to the weapon.

(10) If the borelight does not stop on the zeroing mark, elevation and windage adjustments must be made to the borelight.

(11) From the start point, realign the zeroing mark with the visible laser, rotate the borelight 180 degrees to the half turn position, and identify the reference point. Using the adjusters on the borelight, move the visible laser to the reference point. Rotate the borelight back to the start point; move the zeroing mark to the visible laser.

NOTE: If the visible laser cannot be located when the soldier spins the borelight to the half turn position, start this procedure at 2 meters instead of 10 meters. When the visible laser is adjusted to the reference point at 2 meters, then start the procedure again at 10 meters.

(12) Repeat step (11) until the visible laser spins on itself.

NOTE: Every barrel is different; therefore, steps (8) through (10) must be performed with every weapon to ensure that the borelight is zeroed to that barrel. If the borelight is zeroed, then go directly to the boresighting procedures.

c. **Boresighting.** Weapon stability is crucial in boresighting. The weapon should be in the “bolt forward” position and must not be canted left or right during boresighting procedures. If the weapon is boresighted using field-expedient methods (sandbags, rucksacks) and the weapon is laid on the side for stability, ensure that the boresight target is also oriented in the same manner. Two soldiers (a firer and a target holder) are required to properly boresight a weapon. Their duties are as follows:

- The firer’s primary duty is to zero the borelight and make all adjustments on the aided-vision device being used.
- The target holder secures the 10-meter boresight target straight up and down 10 meters from the borelight, and directs the firer in making necessary adjustments to the aiming device. The target holder must wear night vision goggles when boresighting infrared aiming lasers.

NOTES: 1. Appendix G shows the most current 10-meter boresight target. The 10-meter boresight target grids are 1-centimeter squares, unlike the 25-meter zero targets. Contact the proponent of this publication (C Co, 2/29 IN, Ft Benning, GA) for information about the availability of boresight targets.

2. Weapon stabilization is crucial, orientation is irrelevant.

(1) **Boresighting Iron Sights.** The back-up iron sights (BIS) can be boresighted to a new user to expedite 25-meter zeroing. To boresight using the BIS, align the iron sights with the Canadian bull on the 10-meter boresight target. Make adjustments to the windage and elevation of the iron sights until the borelight is centered with the circle on the boresight target.

(2) **Boresighting the M68, CCO.** Before boresighting ensure that the borelight has been zeroed to the weapon. The more accurate the boresight of the M68 to the assigned weapon, the closer to a battlesight zero the weapon will be. 25-meter zeroing must be conducted to ensure the M68 is properly zeroed.

(a) Select the proper 10-meter boresight target for the weapon and M68 configuration. With the help of an assistant, place the boresight target 10 meters in front of the weapon.

(b) Turn the M68 to the desired setting (position number 4). Have the firer get behind the weapon in a stable supported firing position looking through the M68. Aim the red dot of the M68 on the crosshair located on the 10-meter boresight target. Make adjustments to the M68 until the visible laser of the borelight is centered on the borelight circle on the 10-meter boresight target.

(c) Turn the borelight off. Have the gunner move the weapon off the crosshair, realign the red dot of the M68 on the crosshair, and turn the borelight back on. If the borelight is on the circle and the red dot of the M68 is on the crosshair, the firer's weapon system is boresighted.

NOTE: The M68 is a parallax free sight beyond 50-meters. Boresighting is conducted at 10 meters. This requires the firer to ensure that he acquires the same sight picture and cheek-to-stock weld position each time in order to get a solid boresight. If the firer does not get the same sight picture after the second realignment, he more than likely has a fundamentals problem with his firing position and sight picture. To save time on the range, a coach should troubleshoot the soldier before trying to continue the boresighting of the M68.

(d) Turn the laser off and carefully remove the borelight and the mandrel from the weapon so that the borelight device is not damaged.

(3) **Boresighting TWS.** Before boresighting the TWS, make sure the borelight has been zeroed to the weapon. The more accurate the boresight of the TWS to the assigned weapon, the closer to a battlesight zero the firer will be. Zeroing at 25 meters must be conducted to ensure the TWS is properly zeroed. Both the narrow and wide field of views must be boresighted and zeroed.

(a) Select the proper 10-meter boresight target for the weapon/TWS configuration and, with the help of an assistant, place the boresight target 10 meters in front of the weapon.

(b) Ensure the M16/M4 reticle is displayed. Have the firer get behind the weapon in a stable supported firing position and look through the TWS.

(c) Place a finger on each oval on the 10-meter boresight target. Aim between the fingers with the 300-meter aiming point and make adjustments to the TWS until the visible laser of the borelight is centered on the borelight circle on the 10-meter boresight target.

(d) Have gunner move off the aiming block, realign the TWS to the center of the heated block, and then turn the borelight back on. If the gunner still has the proper boresight alignment the gunner is boresighted; otherwise he will need remedial training on his sight picture.

(e) Change the field of view on the sight by rotating the field-of-view ring and have the gunner repeat steps (a) through (d).

(f) Turn the laser off and carefully remove the borelight and the mandrel from the weapon so that the borelight device is not damaged.

(4) ***Boresighting AN/PAQ-4B/C.*** Before boresighting the AN/PAQ-4B/C, make sure the borelight has been zeroed to the weapon.

DANGER

1. DO NOT STARE INTO THE INFRARED LASER BEAM WITH THE NAKED EYE OR THROUGH BINOCULARS OR TELESCOPES.
2. DO NOT POINT THE INFRARED LASER BEAM AT MIRROR-LIKE SURFACES OR OTHER INDIVIDUALS' EYES.
3. ALTHOUGH THE LASER IS EYE SAFE, IT IS A SAFE PRACTICE TO TREAT ALL LASERS AS NOT EYE SAFE.
4. 3X EXTENDERS MAGNIFY THE LASER AIMING LIGHT; THEREFORE, WHEN USING THE 3X EXTENDERS THE AN/PAQ-4B/C IS CONSIDERED "NOT EYE SAFE" AT ANY DISTANCE.
5. DO NOT STORE THE AN/PAQ-4B/C WITH BATTERIES INSTALLED.

(a) Select the proper 10-meter boresight target for the weapon/AN/PAQ-4B/C configuration and, with the help of an assistant, place the boresight target 10 meters in front of the weapon.

(b) Install the borelight filter and turn the AN/PAQ-4B/C on. Align the 10-meter boresight target with the visible laser of the borelight.

(c) Adjust the adjusters on the AN/PAQ-4B/C until the infrared laser is centered on the crosshair located on the 10-meter boresight target.

- NOTES:**
1. The boresight target and zeroing mark must be kept stable during the boresight procedure.
 2. Do not turn the adjustment screws too much or they will break. Regardless of the mounting location, the adjuster that is on top or bottom will always be the adjuster for elevation and the one on the side will be the windage adjuster.
Elevation adjustment screw—one click at 25 meters = 1 centimeter.
Windage adjustment screw—one click at 25 meters = 1 centimeter.

(5) **Boresighting AN/PEQ-2A.** Before boresighting the AN/PEQ-2A, make sure the borelight has been zeroed to the weapon.

DANGER

1. **INVISIBLE LASER RADIATION. AVOID DIRECT EXPOSURE TO THE BEAM.**
2. **DO NOT STARE INTO THE INFRARED LASER BEAM WITH THE NAKED EYE OR THROUGH BINOCULARS OR TELESCOPES.**
3. **DO NOT POINT THE INFRARED LASER BEAM AT MIRROR-LIKE SURFACES OR OTHER INDIVIDUALS' EYES.**
4. **EYE-SAFE DISTANCE IN TRAINING MODE IS BEYOND 25 METERS IN DUAL LO MODE AND IN TACTICAL MODE IS *BEYOND* 220 METERS.**
5. **EYE DAMAGE CAN OCCUR IF CARELESS HANDLING OF THE LASER OCCURS. IN TRAINING MODE THERE'S A 25-METER DANGER AREA IN DUAL LO MODE AND A 220-METER DANGER AREA IN TACTICAL MODE.**
6. **3X EXTENDERS MAGNIFY THE LASER AIMING LIGHT; THEREFORE, WHEN USING THE 3X EXTENDERS THE AN/PEQ-2A IS CONSIDERED "NOT EYE SAFE" AT ANY DISTANCE.**
7. **DO NOT STORE THE AN/PEQ-2A WITH BATTERIES INSTALLED.**

(a) Select the proper 10-meter boresight target for the weapon and AN/PEQ-2A configuration and, with the help of an assistant, place the boresight target 10 meters in front of the weapon.

(b) Install the filter on the aiming laser and turn the AN/PEQ-2A on. Align the 10-meter boresight target with the visible laser of the borelight.

(c) Adjust the adjusters on the AN/PEQ-2A until the infrared laser is centered on the crosshair located on the 10-meter boresight target.

NOTE: The boresight target and zeroing mark must be kept stable during the boresight procedure.

(d) Adjust the illuminator in the same manner.

(e) Turn the laser off and carefully remove the borelight and the mandrel from the weapon so that the borelight device is not damaged.

NOTES: 1. Each click of elevation and windage is 1 centimeter. For ease, round up to one square. However, each square of the 25-meter zero target is .9 centimeter in actual measurement, which affects large adjustments.

2. Do not turn the adjustment screws too much or they will break. Regardless of the mounting location, the adjuster that is on top or bottom will always be the adjuster for elevation and the one on the side will be the windage adjuster.

(6) **Boresighting AN/PVS-4.** Before boresighting make sure that the borelight has been zeroed to the weapon. The more accurate the boresight of the AN/PVS-4 to the assigned weapon the closer the firer will be to battlesight zero. Zeroing at 25 meters must be conducted to ensure the AN/PVS-4 is properly zeroed.

(a) Select the proper 10-meter boresight target for the weapon and AN/PVS-4 configuration and, with the help of an assistant, place the boresight target 10 meters in front of the weapon.

(b) Ensure the M16 reticle is displayed. Have the firer get behind the weapon in a stable supported firing position and look through the AN/PVS-4.

(c) Turn the borelight laser on. Align the borelight laser with the circle on the 10-meter target offset. Keeping the laser in place, adjust the windage and elevation until the reticle of the AN/PVS-4 is aligned with the circular crosshair.

NOTE: If there is not enough ambient light to see the 10-meter target offset circular crosshair, use a flashlight and shine it indirectly at the target. This will provide enough ambient light for the gunner to see the target.

(d) Turn the borelight off. Have the gunner move his reticle off the circular crosshair and then realign back on the target. Turn the borelight laser back on. If the borelight is in the circle, then the AN/PVS-4 is boresighted.

(e) Turn the laser off and remove the borelight and mandrel from the weapon carefully so that you do not damage the borelight device.

8-3. BACKUP IRON SIGHT

The backup iron sight (BIS) is a semi-permanent flip up sight equipped with a rail-grabbing base. The BIS provides a backup capability effective out to at least 600 meters and can be installed on the M16A4 and M4-series weapons. (Figure 8-6 shows the backup iron sights training program.)

Instructional Intent:

Zero and qualify with the back-up iron sight.

Special Instructions:

Ensure soldiers are applying the marksmanship fundamentals.

Ensure the BIS are in the full vertical position and locked prior to firing.

Ensure the plastic insert is installed in the BIS during boresighting and zeroing.

Observables:

Soldiers attain the same day standards for zeroing and qualification as with the standard iron sights.

Figure 8-6. Backup iron sights training program.

a. **Concept.** The BIS is adjusted for a 300-meter battlefield zero to provide backup in the event an optic or laser device fails to function. The BIS is zeroed on the M4/M4A1 target on the backside of the M16A2 zero targets (NSN 6920-01-395-2949). The 25-meter zeroing procedures are the same as for conventional rear sight assembly on the M16-/M4-series weapons.

b. **Conduct of Training.** All procedures for the BIS are the same as with standard iron sights.

(1) ***Boresight the Iron Sights.*** (Optional.)

(2) ***Zero.*** The zeroing standards for the BIS are the same as with iron sights. To zero the BIS for the M4-series, set the range selector to 300 meters. To zero the BIS to the M16A4 place the range selector to the white line below the 300-meter mark.

(3) ***Target Detection.*** Target detection procedures for the BIS are the same as with standard iron sights.

(4) ***Practice Qualification.*** A practice qualification must always precede an actual qualification. Practice qualification allows the soldier to practice and refine his skills to succeed during qualification. Practice qualification standards for the BIS are the same as with standard iron sights. If the soldier qualifies during the practice qualification it may be counted as the record qualification.

(5) ***Record Qualification.*** Qualification with the BIS is conducted on a standard record fire range, and the standards for qualification are the same as the record fire day standards.

8-4. M68, CLOSE-COMBAT OPTIC

The M68, CCO is a reflex (nontelescopic) sight. It uses a red aiming reference (collimated dot) and is designed for the “two eyes open” method of sighting. The dot follows the horizontal and vertical movement of the gunner’s eye while remaining fixed on the target. No centering or focusing is required. (Figure 8-7 shows the close-combat optic training program.)

Instructional Intent:

Qualify with the M68.

Special Instructions:

Ensure the soldier is proficient with the M68

Ensure with the M16A1/A2 that the M68 does not have the half moon spacer installed

Ensure with the M4, M16A4, and MWS that the M68 has the half moon spacer installed

Ensure the proper offset is used during boresighting procedures

Confirm 10-meter boresight with 25 meter zero

Ensure rail grabber is retightened after initial 3 rounds are fired

Ensure soldier has the M68 dot set for best sight picture.

Ensure that the soldier applies the marksmanship fundamentals

Ensure the soldier zeros and qualifies with the same sight picture (1 or 2 eye method)

Ensure soldier zeros on the M16A2 25 meter zero target

Ensure designated impact zone is 2 1/2 squares down from center mass of the 300-meter silhouette on the 25-meter zero target.

Observables:

The M68 is zeroed to the same standards as with iron sights

Rounds must impact in the 4x4 square designated impact zone.

Soldier achieves the same practice qualification and qualification standards as with day record fire.

Figure 8-7. M68, close-combat optic training program.

a. **Concept.** Soldiers must qualify on their assigned weapons during daylight conditions as outlined in this manual. The integrated act of firing with the M68 is identical to the iron sights except for the change in sight picture. The M68 training strategy is the same as the iron sight training strategy.

b. **Conduct of Training.** All procedures for the M68 are the same as with standard iron sights. The M68 equipment training should familiarize the soldier with the proper operation and characteristics of the M68 in accordance with TM 9-1240-413-12&P.

(1) **Modified Fundamentals.** The fundamentals of marksmanship are modified as follows:

(a) *Steady Position.* Placing the cheek on the stock weld to get a good sight picture after the M68 is zeroed at 25 meters is no longer necessary. The M68's reflexive sight allows the soldier to fire the weapon with his cheek at a comfortable position; however, the soldier must zero with the same cheek position he will fire with because the parallax free is only effective beyond 50 meters.

(b) *Aiming.* The preferred method of aiming using the M68 is to keep both eyes open, which allows a much greater field of view and makes scanning for targets much easier. However, getting accustomed to the two-eyes-open method takes practice. The soldier must keep the rifle and M68 in a vertical alignment each time he fires.

- *Two-eyes-open method (preferred).* Position the head so that one eye can focus on the red dot and the other eye can scan downrange. Place the red dot on the center of mass of the target and engage.
- *One-eye-open method.* With the nonfiring eye closed, look through the M68 to ensure that the red dot can be seen clearly. Place the red dot on the center of mass of the target and engage. If the soldier zeros his weapon using the

one-eye-open method, he must engage targets using this method for zero accuracy.

(c) *Breath Control*. This fundamental does not change.

(d) *Trigger Squeeze*. This fundamental does not change.

NOTE: The aiming method used to zero must also be used to engage targets. When using the M68, the weapon must not be canted during aiming or firing.

(2) **M68 Dry (Nonfiring) Zeroing.** Starting with a securely installed and live-fire zeroed BIS, mount the reflex sight to the front of the receiver rail or to the top RAS as preferred. Adjust windage and elevation on the reflex sight until the center of the aiming dot is at the tip of the front sight post when viewed through the BIS while assuming a normal firing position.

(3) **25-Meter Zero Procedures.** When zeroing the M68, CCO at 25 meters, a designated impact zone must be identified on the 25-meter zero target. Starting from center mass of the 300-meter silhouette on the 25-meter zero target, count down 2 1/2 squares and make a mark. This is now the point of impact. From this point, make 4x4 squared box around the point of impact. This box is now the offset and is the designated point of impact for the M68. Soldiers will aim center mass of the 300-meter silhouette and will make adjustments to the M68 so that the rounds impact in the 4x4 squared box, 2 1/2 squares down from the point of aim. Other procedures are the same as standard iron sight procedures.

- Two clicks = 1 centimeter at 25 meters for windage and elevation.
- One click clockwise on elevation moves bullet strike down.
- One click clockwise on windage moves bullet strike left.
- Conduct zeroing only on the M16A2 25-meter zero target.

NOTES:

1. At ranges of 50 meters and beyond, the effects of parallax are minimal. However, at ranges of 50 meters and closer, parallax exists and the firer must ensure that the red dot is centered while zeroing.
2. The aiming method (two eyes open or one eye open) used to zero must be used to engage targets.

(4) **Target Detection.** Target detection procedures for the M68 are the same as with standard iron sights.

WARNING

In position 4 and above, the red dot is visible through the front of the sight. For night vision operations, close the front lens cover before turning the rotary switch clockwise to position 2 and 3. Check the light for proper intensity before opening the front lens cover. Close the front lens cover before turning the rotary switch counterclockwise to the OFF position. Failure to follow this warning could reveal your position to the enemy.

(5) *Practice Qualification.* The procedures are the same as standard iron sight procedures.

(6) *Record Qualification.* The procedures are the same as standard iron sight procedures.

8-5. AN/PAS-13 (V2), (V3), THERMAL WEAPON SIGHT

The AN/PAS-13 (V2), (V3), thermal weapon sight (TWS) is an IR imaging sensor used for target acquisition under conditions of low visibility. IR light is received through the telescope, detected by an IR sensor, converted to digital data, processed, and displayed for the user. (Figure 8-8 shows the AN/PAS-13 training program.)

Instructional Intent:

Qualify with the ANPAS-13, TWS.

Special Instructions:

Ensure soldiers are proficient with the TWS.

Ensure spacer is used with the M4, M16A4, and MWS.

Ensure proper 10-meter boresight target is used during boresight procedures.

Ensure both fields of view (FOV) are boresighted.

Confirm 10-meter boresight with a 25-meter zero.

Ensure M16A2 zero target is used with a four-by-four-centimeter square cut out of the center of the silhouette.

Ensure zero range and qualification range have been thermalized.

Ensure that during zero and qualification every other lane is used.

Ensure range has been inspected for targets that are not thermalized.

Observables:

The TWS is zeroed to the same standards as with iron sights.

Soldier achieves the same practice qualification and qualification standards as with day record fire.

Figure 8-8. AN/PAS-13 (TWS) training program.

WARNING

Ensure the weapon is not loaded and is on SAFE before installing the TWS on the weapon. A loaded weapon may accidentally discharge causing severe injury or death.

a. **Concept.** Training strategy on the AN/PAS-13 is much the same as aiming lights. The TWS is a thermal sight and does not require the use of night vision devices. The course of fire for the TWS is the same scenario as the day qualification tables with the same requirements for standards of fire for current day standards. Qualification standards are the same for day and night.

b. **Conduct of Training.** AN/PAS-13 equipment training should familiarize the soldier with the proper operation and characteristics of the TWS in accordance with the TM to include:

(1) **Modified Fundamentals.** The fundamentals of BRM change as follows:

(a) *Steady Position.* This fundamental slightly changes due to the height of the sight. Soldiers must adjust their body position so they can properly look through the sight. In most cases, the cheek-to-stock weld no longer exists.

(b) *Aiming.* To properly aim with the TWS, soldiers must ensure that the correct reticle is selected in the sight. (Refer to TM 11-5855-312-10, 31 Oct 00 for reticle selection and point of aim for use with the TWS.)

(c) *Breath Control.* This fundamental is not affected by night firing conditions using the TWS.

(d) *Trigger Squeeze.* This fundamental of marksmanship does not change during night firing.

(2) **25-Meter Zero Procedures.** Refer to TM 11-5855-312-10, 31 Oct 00 for target preparation.

(a) Use the same procedures and standards as with iron sights.

(b) At the 25-meter range each increment of azimuth or elevation setting moves strike of the round as follows:

- 1 1/4 centimeters for MTWS on WFOV.
- 3/4 centimeter for MTWS on NFOV.
- 3/4 centimeter for HTWS on WFOV.
- 1/4 centimeter for HTWS on NFOV.

(c) **Retighten the rail grabber** after the first three rounds fired.

(d) Zero both FOVs (Figure 8-9).

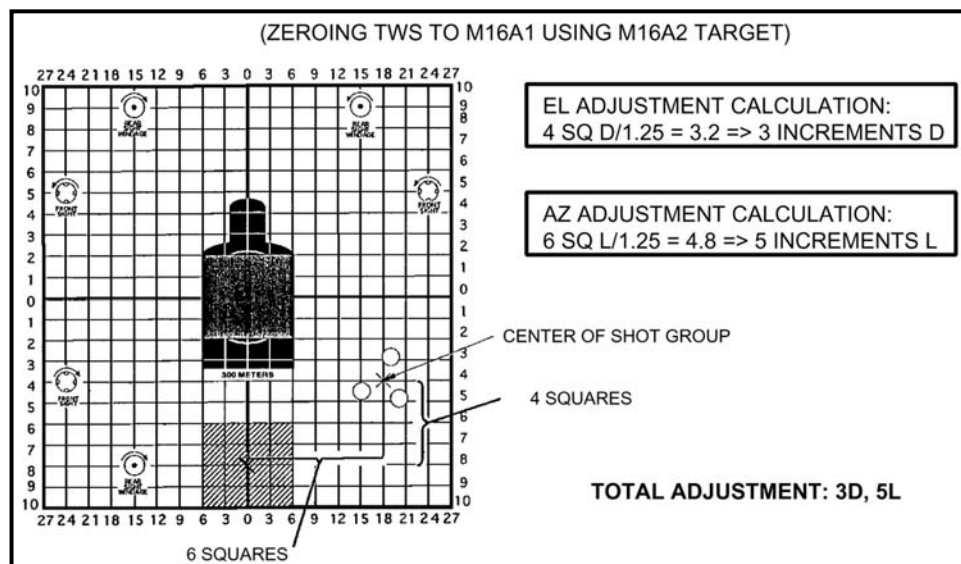


Figure 8-9. Example of TWS zeroing adjustments.

(3) **Target Detection.** With night vision devices the field of view is much smaller, scanning becomes much more deliberate, and, with the TWS, camouflage becomes less of a factor. Even though night vision devices greatly enhance the soldier's ability to acquire a target at night, increased awareness of target detection must be trained to allow the soldier to key in on the visual cues of infrared imagery.

(a) **Select Position.** The TWS is a large device; therefore, selecting a position that allows for good fields of view but at the same time does not silhouette the soldier and his equipment might be a challenge. Since the TWS detects thermal energy (heat) emitted from an object, a position near an object emitting a vast amount of thermal energy (for example, a vehicle with the engine running, a fire, or so on) may affect the soldier's ability to acquire a target.

(b) **Scanning.** With earlier versions of the TWS, scanning too fast causes a stuttering on the screen, which causes the soldier to miss or overlook a target. With these versions scanning must be done slowly in order to maintain a good thermal image on the screen. With the newer version, this stuttering is not as obvious. One advantage the TWS (heavy and medium) has over other night vision devices is that it has two fields of view—wide and narrow. Each field of view has its own advantages and disadvantages. The narrow field of view increases magnification but decreases the field of view. The wide field of view decreases magnification but increases the field of view. The soldier chooses which field of view to use to scan and engage targets.

(c) **Target Indicators.** While scanning the sector and or lane with the TWS, the soldier should be aware of thermal cues that allow him to detect and identify targets. The engine compartment, exhaust, and tires of a vehicle that has been moving are all examples of thermal cues. Adjusting the brightness, contrast, and polarity helps enhance the thermal cues of a target, allowing for quicker detection and identification.

(d) **Sound.** Use the same techniques outlined in day and night target detection.

(e) **Movement.** Thermal cues become much more obvious on a moving object than on an object standing still. A good example is the tire on a vehicle. With the vehicle not

moving, the tires are cold. On a moving vehicle, the friction between the road and the tires causes the tires to heat up and become prominent when observed through the TWS. The same is true with the human body—a person moving generates more heat than someone standing still.

(f) *Camouflage*. Probably the biggest advantage the TWS provides is its ability to negate camouflage. The TWS gives the soldier the ability to see through camouflage, such as paint, foliage, and camouflage netting, thereby increasing both day and night target-detecting abilities.

WARNING

If the TWS is operated with the eyecup removed, light emitting from the eyepiece may be visible to the enemy's night vision devices.

(4) *Practice Qualification*. Practice qualification with the TWS is the same as day practice qualification with iron sights. Dry fire is done to allow the soldiers to make adjustments to the TWS. Every other firing lane should be used so that the soldier engages only the targets in his lane.

(5) *Record Qualification*. Record qualification with the TWS is the same as day record qualification with iron sights.

- NOTES:**
1. Record qualification with the TWS can be done day and or night. Regardless of the qualification, the standard day record fire for the iron sights will be used. The standards for qualification with the TWS, either day or night, are 23 out of 40.
 2. During practice qualification and qualification, it is the soldiers preference on polarity and field of view.

8-6. AN/PAQ-4B/C AND AN/PEQ-2A INFRARED AIMING LASERS

The newest infrared aiming lasers greatly increase the night firing accuracy of all infantry weapons. The infrared aiming lasers complete the transition from day optics to night optics. Their effectiveness is limited by the capability of the image-intensifying (I2) sight with which they are used. (Figure 8-10 shows the current training program for these lasers.)

Instructional Intent:

Qualify with the AN/PAQ-4B/C or AN/PEQ-2A.

Special Instructions:

Ensure soldiers are proficient with the AN/PAQ-4B/C or AN/PEQ-2A.

Ensure proper 10-meter boresight target is used during boresight procedures.

Ensure borelight filter is used.

Ensure AN/PEQ2A is set to AIM LO.

Ensure illuminator on the AN/PEQ-2A is boresighted.

Ensure M16A2 25-meter zero target is used for 25-meter zero.

Ensure a 3x3-cm hole is cut in the center of the 25-meter zero target and E-type silhouette.

Observables:

Soldier conducts either 10-meter boresight or a 25-meter zero.

Soldier displays good scanning, IR discipline, and IR walking technique.

Soldier achieves at least 17 target hits out of 40 target exposures.

Figure 8-10. AN/PAQ-4B/C or AN/PEQ-2A training program.

a. **Concept.** Two training strategies have been devised to adequately train soldiers in the use of the AN/PAQ-4B/C and AN/PEQ-2A infrared aiming laser devices. The night initial training strategy is used for soldiers who have little or no previous experience with night vision goggles, or for units beginning a night-training program. The night sustainment training strategy is for soldiers who are familiar with night vision goggles, and for units that have already implemented a night-training program. However units should always review the night initial training strategy prior to sustainment training.

b. **Conduct of Training.** AN/PAQ-4B/C and AN/PEQ-2A equipment training should familiarize the soldier with the proper operation and characteristics of the AN/PAQ-4B/C and the AN/PEQ-2A in accordance with the TM to include:

(1) **Modified Fundamentals.** Although the same four fundamentals of marksmanship are used for night firing, adjustments must be made to accommodate the night vision devices.

(a) *Steady Position.* The firer's natural tendency is to attempt to acquire a good cheek-to-stock weld position and align the iron sights. The gunner must realize that a good cheek-to-stock weld is not possible with NVGs mounted on his head. The firer should ensure that the butt of the weapon is firmly pulled into the pocket of the shoulder to prevent the laser from wobbling. When the soldier is ready to fire, the elbows are firmly planted on the ground to prevent the laser from wobbling excessively.

(b) *Aim.* The gunner must practice raising his head just enough to clear the weapon with his NVGs and acquire a good sight picture by walking the laser onto the target and then aiming at center mass.

(c) *Breath Control.* This fundamental is not modified for night firing conditions.

(d) *Trigger Squeeze.* The objective is to not disrupt alignment of the laser with the target by jerking the trigger.

(2) **25-Meter Zero Procedures.** If the borelight is not available a 25-meter zero must be conducted.

(a) *AN/PAQ-4B/C.*

- Same standards as with iron sights.
- Set the adjusters to their zero preset position (refer to TM 11-5855-301-12&P).
- Prepare 25-meter zero target by cutting a 3x3-centimeter square out of the center of the silhouette.
- Elevation adjustment screw—one click at 25 meters = 1 centimeter (clockwise = up).
- Windage adjustment screw—one click at 25 meters = 1 centimeter (clockwise = left).
- **Retighten rail grabber** after the first three rounds are fired.

NOTE: When cutting the 3-centimeter square out of the target, some of the strike zone may be cut out. Care must be taken when annotating the impact of the rounds. When the weapon is close to being zeroed, some of the shots may be lost through the hole in the target.

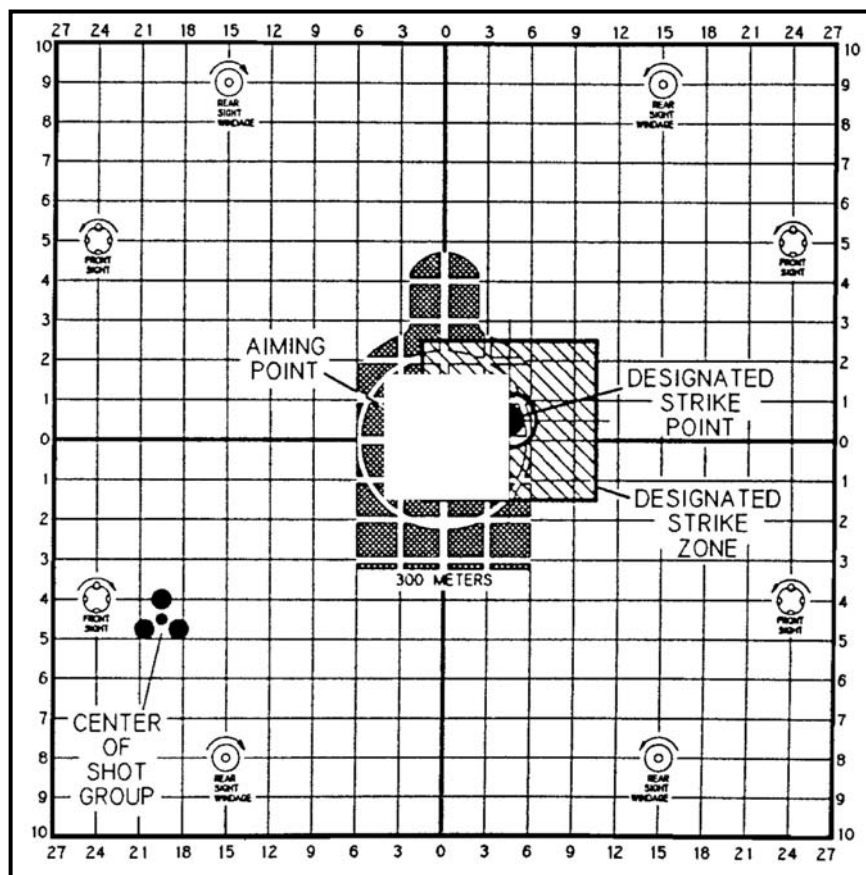


Figure 8-11. Example of shot group adjustment with strike zone.

(b) *AN/PEQ-2A*.

- Same standards as with iron sights.
- Set the adjusters to their zero preset position (refer to TM 11-5855-308-12&P).
- Prepare the 25-meter zero target by cutting out a 3x3-centimeter square in the center of the target and E-type silhouette.
- Turn the aiming beam on in the low power setting (AIM LO). Install aim point filter to eliminate excessive blooming.
- The adjustments for the AN/PEQ-2A (top mounted) are as follows:
 - **AIMING POINT.**
 - Elevation adjustment screw—one click at 25 meters = 1 centimeter or one square (clockwise = up).
 - Windage adjustment screw—one click at 25 meters = 1 centimeter or one square (clockwise = right).
 - **TARGET ILLUMINATOR.**
 - Elevation adjustment screw—one click at 25 meters = 1 centimeter or one square (clockwise = down).
 - Windage adjustment screw—one click at 25 meters = 1 centimeter or one square (clockwise = right).
- **Retighten rail grabber and AN/PEQ2A.**
- Once the aiming beam is zeroed, rotate the selector knob to the DUAL LO, DUAL LO/HI or DUAL HI/HI mode to observe both aiming and illumination beams. Rotate the illumination beam adjusters to align the illumination beam with the aiming beam.

NOTES: 1. Failure to fully tighten the mounting brackets and AN/PEQ2A thumbscrew may cause zero retention problems. Confirm that equipment is tight prior to zeroing.

2. To retain zero, remove the TPIAL and rail grabber as a whole assembly and place back onto the same notch as removed.

(3) **Target Detection.** Soldiers should receive in-depth instruction on the proper use and fit of night vision goggles to include characteristics and capabilities, maintenance, and mounting procedures. Extensive testing has proven that the average soldier does not properly use the night vision devices. Unit leaders must be proficient in the train-the-trainer strategy. At night, soldiers should conduct a terrain walk to become more familiar and build confidence using the night vision goggles.

(a) *Scanning for Targets.* The night vision devices have a 40-degree field of view, which causes the average shooter to miss easy targets of opportunity. The soldier must be trained to aggressively scan his sector of fire for targets. The art of target detection at night is only as good as the soldier practices. Regular blinking during scanning relieves some of the eyestrain that the soldier tends to have trying to spot distant targets. Regular blinking must be reinforced during training. After the soldier has mastered the art of scanning he will find that targets are more easily detected by acknowledging the flicker or the movement of a target.

(b) *IR Discipline.* A soldier must be taught that what he can see downrange or on the battlefield through his NVGs, the enemy can also see. The soldier must train to activate his laser at the base of the target and engage the target as soon as the target is detected. After the target has been engaged, the laser is deactivated. When a soldier uses proper IR discipline while scanning for targets, he must keep his weapon oriented within his sector of fire. When the target is detected the soldier orients his weapon around the base of the target, activates his laser, and walks the laser to the center mass of the target for engagement.

(4) *Field Fire.* During the dry-fire exercise, soldiers acquire a sight picture on all exposed silhouette targets before conducting the field-fire scenario. This allows the soldier to focus on the targets at range.

- Conduct dry-fire exercise.
- Conduct in the same manner as field fire II.
- Targets at 50, 150, and 250 meters.
- 36 rounds, 18 rounds supported firing position, 18 rounds prone unsupported firing position.

(5) *Practice Qualification.* The procedures for practice qualification are:

- Conduct dry-fire exercise.
- Use coaches.
- 20 rounds foxhole supported, 20 rounds unsupported.
- Engage targets from 50 to 250 meters.
- Standards are 17 out of 40.

(6) *Record Qualification.* The procedures for record qualification are:

- Conduct dry-fire exercise.
- 20 rounds foxhole supported, 20 rounds unsupported.
- Engage targets from 50 to 250 meters.
- Standards are 17 out of 40.

8-7. AN/PVS-4 NIGHT VISION DEVICE

The AN/PVS-4 night vision device is a portable, battery operated electro-optical instrument used for observation and aimed fire of weapons at night. It amplifies reflected light such as moonlight, starlight, and sky glow so that the viewed scene becomes clearly visible to the operator. It can be mounted on the M16A2 rifle, M4 carbine, M16A4 rifle, and M4 MWS. Mounting brackets are provided for each type of weapon. (Figure 8-12 shows the AN/PVS-4 training program.)

Instructional Intent:

Qualify with the AN/PVS-4 night vision device.

Special Instructions:

Ensure soldiers are proficient with the AN/PVS-4.

Ensure that the spacer and Picatinny rail grabber are installed when mounting on MWS.

Ensure proper 10-meter boresight target is used during boresight procedures.

Ensure proper reticle is used.

Confirm 10-meter boresight with a 25 meter zero.

Observables:

The AN/PVS-4 is zeroed to the same standard as with the iron sight.

Soldier achieves same practice and qualification standards as done with day record fire.

Figure 8-12. AN/PVS-4 training program.

a. **Concept.** Training strategy on the AN/PVS-4 is much the same as aiming lights. The course of fire for the AN/PVS-4 sight is the same scenario as with the aiming lasers with the same qualifications standards.

b. **Conduct of Training.** This training should familiarize the soldier with the proper operation and characteristics of the AN/PVS-4 in accordance with the TM.

(1) **Modified Fundamentals.** The fundamentals are changed as follows:

- *Steady position.* This fundamental slightly changes due to the height of the sight. Soldiers must adjust their body position so they can properly look through the sight. In most cases, the cheek-to-stock weld no longer exists.
- *Aiming.* To properly aim the AN/PVS-4, the soldier must ensure that the proper reticle is inserted in the sight. (Refer to TM 11-5855-213-10 to insert the proper reticle.) The aiming point is placed center mass of the target.
- *Breath control.* This fundamental is not affected by night firing conditions using the AN/PVS-4.
- *Trigger squeeze.* This fundamental of marksmanship does not change during night firing.

(2) **25-Meter Zero Procedures.** Use the same procedures and standards as with the iron sights along with the following.

- At 25-meter range each increment of azimuth or elevation setting moves the strike of the round .63 centimeters or 1/4 mil. Two clicks of the windage or elevation will move the strike of the round approximately one square on the M16A2 zero target.
- Retighten the thumb screw on the rail grabber after initial three rounds fired.

NOTE: During boresighting or zeroing procedures if there is not enough ambient light available to see either the boresight mark at ten meters or the silhouette on the zero target, a flashlight can be used by shining the light indirectly towards the target. This will provide enough ambient light to allow the soldier to boresight or zero.

(3) **Target Detection.** Target detection with the AN/PVS-4 is very similar to target detection with the night vision goggles. The AN/PVS-4 has a 14.5-degree field of view leaving the average shooter to miss easy targets of opportunity, more commonly the

50-meter left or right. The soldier must be trained to aggressively scan his sector of fire for targets. The art of target detection at night is as good as the soldier practices. Regular blinking during scanning relieves some of the eyestrain that the soldier tends to have trying to spot far targets. Regular blinking must be reinforced during training. After the soldier has mastered the art of scanning he will find that targets are more easily detected by acknowledging the flicker or the movement of a target.

(4) **Field Fire.** During the dry-fire exercise soldiers acquire a sight picture on all exposed silhouette targets prior to conducting the field-fire scenario. This allows the soldier to focus on the targets at range.

- Conduct dry-fire exercise.
- Conducted in the same manners as Field Fire II (see Appendix F, for scenario).
- Targets at 50, 150, and 250 meters.
- 36 rounds—18 rounds supported firing position, 18 rounds prone unsupported firing position.

(5) **Practice qualification.** The procedures for practice qualification are:

- Conduct dry fire exercise.
- Coaches are to be utilized.
- 20 rounds foxhole supported, 20 rounds unsupported.
- Engage targets from 50 to 250 meters.
- Standards 17 out of 40.

(6) **Record qualification.** The procedures for record qualification are:

- Conduct dry fire exercise.
- 20 rounds foxhole supported, 20 rounds unsupported.
- Engage targets from 50 to 250 meters.
- Standards 17 out of 40.